

REMARKS

Claims 1-38, 40-49, 52-55, 58-60, 62-68, 70-71 and 73-75 are pending in this application. Claims 1-37 were previously withdrawn. Claims 39, 50 and 61 were previously canceled. Claims 51, 56, 57, 69 and 72 are canceled herein. Claims 38, 52, 63 and 70 have been amended herein. In view of these amendments and remarks, Applicants respectfully request reconsideration of the claims.

Claims 38, 40-47, 56, 57, 59, 63-66, 72 and 74 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,715,039 to Fukuda, *et al.* (hereinafter “Fukuda”). Applicants respectfully traverse this rejection.

Fukuda was cited for disclosing an immersion lithography method and apparatus using a chemically amplified photoresist and water as an immersion fluid, and subsequently developing the photoresist.

Claim 38 now recites:

A method for illuminating a semiconductor structure having a topmost photoresist layer, comprising the steps of:

providing the semiconductor structure comprising an integrated circuit that includes transistors with a gate length not greater than 50 nm, the structure coated with the topmost photoresist layer, the topmost photoresist layer comprising a chemically amplified photoresist that forms a photo-generated acid catalyst of the form HA, where H is hydrogen;

introducing an immersion fluid comprising water into a space between an optical surface that is soluble in water and the photoresist layer, said immersion fluid having a pH of less than 7 and the water in contact with a portion of the photoresist layer;

directing optical energy through the immersion fluid and onto said photoresist layer; and

subsequently developing the photoresist layer.

Applicants respond that claim 38 recites elements not suggested or disclosed by Fukuda. Fukuda fails to describe the material used for the photoresist, Fukuda fails to describe the pH used in the immersion liquid. Fukuda fails to disclose the composition of the water.

Accordingly, Applicants believe that claim 38 is unanticipated by the reference relied upon by the Examiner, and is therefore allowable. Reconsideration and allowance are respectfully requested for claim 38.

Claims 56, 57 and 69 are canceled herein. Claims 40-47 are dependent claims depending from claim 38 which were similarly rejected as anticipated by Fukuda. These claims each depend from and recite additional limitations on the method of claim 38. These dependent claims also necessarily incorporate the allowable limitations of claim 38, and for this reason at least, are also believed to be unanticipated and allowable. Reconsideration and allowance are therefore requested.

Claims 38, 40-47, 57, 59, 62-66 and 74 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication No. 2003/0144408 to Rostalski, *et al.* (hereinafter “Rostalski”) in view of Casiday (“Water Hardness: Inorganic Reactions Experiment”) and U.S. Patent Publication No. 2004/0038556 to French, *et al.* (hereinafter “French ‘556”). Applicants respectfully traverse this rejection.

The Examiner cites Rostalski for an immersion lithography method with water. He admits the reference does not disclose many claimed features, for example the pH of the water, and the developer. The Examiner cites Casiday for the pH of the water. The Examiner then proposes to combine French ‘556. French ‘556 discloses a method for developing a resist exposed in an immersion oil.

Applicants reply that even if this combination were made in the manner proposed by the Examiner, the features of claim 38 are not disclosed in the relied upon reference taken singly or in combination, and thus, claim 38 is not obviated by the rejection. For example, the references taken together fail to teach that the water comprises fluoride, which the resist is chemically amplified and forms photo-generated acid catalyst.

Claim 38 is not obvious over these references and is therefore believed to be allowable over the rejection. Reconsideration and allowance are respectfully requested for claim 38.

Claims 57 and 69 are canceled. Claims 40-47 and 62 are dependent claims depending from claim 38 which were similarly rejected. These claims each depend from and recite additional limitations on the method of claim 38. These dependent claims also necessarily incorporate the allowable limitations of claim 38, and for this reason at least, are also believed to be unobvious over the relied upon combination of references and allowable over the rejection. Reconsideration and allowance are therefore requested.

Claim 63 is another independent claim which recites:

A method for illuminating a semiconductor structure having a topmost photoresist layer, comprising the steps of:

providing the semiconductor structure comprising an integrated circuit that includes transistors with a gate length not greater than 50 nm, coated with the topmost photoresist layer, the topmost photoresist layer being a chemically amplified photoresist that forms a photo-generated acid catalyst of the form HA, where H is hydrogen;

introducing water having a fluorine containing compound dissolved therein into a space between an optical surface that is soluble in water and formed of a material including fluoride and the photoresist layer said water having a pH of less than 7, the water contacting a portion of the optical surface and a portion of the photoresist layer;

directing light with a wavelength of less than 450 nm through the water and onto said photoresist; and

subsequently developing the photoresist layer.

Applicants respectfully submit that similar to claim 38, claim 63 recites elements not disclosed in Rostalski, Casiday or French '556, whether taken singly or combination. For the reasons argued above, claim 63 is believed to disclose elements that are not obviated by the relied upon references. Accordingly, reconsideration and allowance are requested.

Claims 64-66 and 74 are dependent claims depending from claim 63 which were similarly rejected. These claims each depend from and recite additional limitations on the method of claim 63. These dependent claims also necessarily incorporate the allowable limitations of claim 63, and for this reason at least, are also believed to be unobvious over the relied upon combination of references and allowable over the rejection. Reconsideration and allowance are therefore requested.

Claims 48, 49, 67 and 68 were rejected under U.S.C. § 103(a) as being unpatentable over Rostalski in view of Casiday and French '556, and further in view of U.S. Patent Publication No. 2004/0175647 to French (hereinafter "French '647"). Applicants respectfully traverse this rejection.

French '647 is apparently cited to add the particular optical surface materials recited in these dependent claims. Applicants believe that this combination would not be made by one skilled in the art at the time the invention was made to reach the claimed embodiments. French '647 discloses that the liquid should be a compound that is less than "20 parts per million" water (Summary, paragraph 0022 of French). According to French '647, compounds free from water are desirable as immersion liquids, in direct contrast to the immersion liquids claimed. One skilled in the art would not look to French '647 for the claimed combination. Since French '647 is relied upon for the elements recited in these rejected claims, and it is not available for

combination to obviate the claims as suggested by the Examiner, reconsideration and allowance are requested.

As an independent argument, Applicants respond that claims 48-49 depend from and recite additional features on the method of claim 38, which is believed to be allowable over the combination. French '647's lens disclosures do not cure the deficiencies of the rejections of the parent claim. These dependent claims add features to the allowable limitations of claim 38, and for this reason at least, are also believed to be allowable over the rejection. Reconsideration and allowance are therefore respectfully requested.

As an alternate independent argument, Claims 67-68 similarly depend from and recite additional features on the method of claim 63, which is believed to be allowable. The disclosure of French '647, even if combined with the three remaining references, does not obviate the features of the parent claim. As these dependent claims add features to and necessarily incorporate the allowable features of claim 63, they also are believed to be allowable. Reconsideration and allowance are therefore respectfully requested.

Claims 58, 60, 73 and 75 have been rejected under U.S.C. § 103(a) as being unpatentable over Rostalski in view of Casiday and French '556 and further in view of U.S. Patent Publication No. 2005/0018208 to Levinson (hereinafter "Levinson"). Applicants respectfully traverse this rejection.

Levinson is added to the immersion lithography of Rostalski and the deionized water of Casiday combined with the immersion oil of French '556. Levinson is apparently cited for the disclosure of immersion of the wafer and the wafer stage.

Claims 58 and 60 depend from claim 38. As argued above, claim 38 is believed to be allowable. Applicants submit that claims 58 and 60 depend from and recite additional features

on the method of claim 38; which is believed to be allowable over the combination. Levinson's disclosures do not cure the deficiencies of the rejections of the parent claim. These dependent claims add features to the allowable limitations of claim 38, and for this reason at least, are also believed to be allowable over the rejection. Reconsideration and allowance are therefore respectfully requested.

Claims 73 and 75 are dependent claims depending from claim 63. As argued above, claim 63 is believed to be allowable. Applicants respectfully submit that claims 58 and 60 depend from and recite additional features on the method of claim 38; which is believed to be allowable over the combination. Levinson's disclosures do not cure the deficiencies of the rejections of the parent claim. These dependent claims add features to the allowable limitations of claim 38, and for this reason at least, are also believed to be allowable over the rejection. Reconsideration and allowance are therefore respectfully requested.

Claims 51-55 and 69-71 were rejected under U.S.C. § 103(a) as being unpatentable over Rostalski in view of Casiday, French '556, French '647 and further in view of U.S. Patent Publication No. 2005/0164522 to Kunz, *et al.* (hereinafter "Kunz"). Applicants respectfully traverse this rejection.

Applicants first respond that one skilled in the art would not look to Kunz in combination with the other four other references previously relied upon for the elements recited. Kunz specifically restricts the immersion fluid used to be one in which the photoresist is not active or soluble. See paragraph 0119. Kunz clearly teaches away from immersion fluid materials in which the resist could be affected. Further, Kunz discloses non-water based immersion fluids based on perfluoroethers having certain clarity characteristics. In contrast and directly in opposition to the strictures disclosed by Kunz, the methods recited by Applicants in the parent

claims 38 and 63 are directed to a water based immersion system in which the photoresist could be dissolved or affected. The photoresist has a hydrogen acid catalyst which can be affected by water. Thus, one skilled in the art would not (at the time the invention was made) add the fifth reference of Kunz to the four-way combination proposed by the Examiner. Further, as argued above, the French '647 reference teaches away from immersion fluids that are water or comprise water. As the combination relied upon is not available as prior art, the claims rejected are not obvious. Reconsideration and allowance are therefore respectfully requested.

As an independent argument, Applicants respond that claims 52-55 depend from and recite additional features on the method of claim 38, which is believed to be allowable over the combination even if made as proposed. Kunz' disclosures do not cure the deficiencies of the rejections of the parent claim. These dependent claims add features to the allowable limitations of claim 38, and for this reason at least, are also believed to be allowable over the rejection. Reconsideration and allowance are therefore respectfully requested.

Claim 51 is canceled.

As an alternate independent argument, Claims 70-71 similarly depend from and recite additional features on the method of claim 63, which is believed to be allowable. The disclosure of Kunz, even if combined with the four remaining references, does not obviate the features of the parent claim. As these dependent claims add features to and necessarily incorporate the allowable features of claim 63, they also are believed to be allowable. Reconsideration and allowance are therefore respectfully requested.

Claim 69 is canceled herein.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Mark E. Courtney, Applicants' attorney, at 972-732-1001, so that such issues may be resolved as expeditiously as possible. No fee is believed due in connection with this filing. However, should one be deemed due, the Commissioner is hereby authorized to charge Deposit Account No. 50-1065.

Respectfully submitted,

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Mark E. Courtney
Mark E. Courtney
Attorney for Applicants
Reg. No. 36,491

Slater & Matsil, L.L.P.
17950 Preston Rd., Suite 1000
Dallas, Texas 75252-5793
Tel. 972-732-1001
Fax: 972-732-9218